

WHAT IS CLAIMED IS:

1. A sheet handling apparatus including:
  - a main unit;
  - a sheet validating device for determining whether a sheet received from outside is valid or not, the sheet validating device being provided in the main unit;
  - a sheet receiving unit which is detachable from the main unit;
  - a sheet feed device for feeding the sheet which is determined as valid by the sheet validating device to the sheet receiving unit;
  - a plurality of stopper walls disposed in the sheet receiving unit;
  - a sheet support plate slidably arranged in the sheet receiving unit, the sheet support plate having a sheet support plane which is urged toward at least one side of the stopper walls;
  - a sheet push plate arranged at the other side of the stopper walls so as to face the sheet support plane, the sheet push plate moving the sheet fed to the sheet receiving unit through the sheet feed device, toward the sheet support plane while pushing the sheet; and
  - a push device for rotating the sheet push plate downward while retaining a parallel relation between a sheet push plane of the sheet push plate and the sheet support plane of the sheet support plate, thereby the sheet push plate draws and separates the sheet fed to the sheet receiving unit from the sheet feed device and pushes the sheet to the sheet support plane of the sheet support plate.
2. The sheet handling apparatus according to claim 1, wherein the push device is constructed from a parallel crank mechanism connected to the sheet push plate.

3. The sheet handling apparatus according to claim 2, wherein the parallel crank mechanism comprises:

a first link with a first end which is rotatably connected to a first rotational center positioned at an upper part of the sheet push plate;

a second link with a first end which is rotatably connected to a second rotational center positioned at a lower part of the sheet push plate;

a first shaft which is connected to a third rotational center positioned at a second end opposite to the first end in the first link, the second end being rotatable around the first shaft; and

a second shaft which is connected to a fourth rotational center positioned at a second end opposite to the first end in the second link, the second end being rotatable around the second shaft;

whereby the parallel crank mechanism constructs a quadric chain mechanism.

4. The sheet handling apparatus according to claim 3, wherein a first distance between the first rotational center and the second rotational center equals to a second distance between the third rotational center and the fourth rotational center,

wherein a third distance between the first rotational center and the third rotational center equals to a fourth distance between the second rotational center and the fourth rotational center, and

wherein a fixed link connecting the third rotational center and the fourth rotational center is arranged substantially parallel with a movement direction of the sheet fed out from the sheet feed device.

5. The sheet handling apparatus according to claim 4, further comprising:

a return member for urging the sheet push plate toward the fixed

link.

6. The sheet handling apparatus according to claim 5, wherein the return member comprises a torsion coil spring put on the first shaft or the second shaft.

7. The sheet handling apparatus according to claim 1, further comprising a drive device arranged in the main unit outside of the sheet receiving unit, the drive device driving the push device;

wherein the drive device comprises:

a reciprocating rod having a roller pushing the sheet push plate at a top end thereof, the reciprocating rod being movably arranged in a direction normal to the sheet push plane of the sheet push plate;

a follower cam supporting a rear end of the reciprocating rod and having a guide groove in a direction normal to a movement direction of the reciprocating rod;

a first gear having a crank pin which is movably connected to the guide groove in the follower cam, the crank pin being positioned outside of a rotational center thereof;

a second gear for transmitting rotational motion to the first gear;

a worm gear fixed coaxially with the second gear; and

a motor having a rotational shaft on which a worm meshing with the worm gear is fixed.

8. The sheet handling apparatus according to claim 1, further comprising a drive device arranged in the main unit outside of the sheet receiving unit, the drive device driving the push device;

wherein the drive device comprises:

a plunger having a roller pushing the sheet push plate at a top end thereof and a compression coil spring put on a rear end thereof; and

a magnetic solenoid with a magnetic core for attracting the plunger so as to be moved toward the sheet push plate by energizing thereof.

9. The sheet handling apparatus according to claim 1, further comprising a drive device arranged in the main unit outside of the sheet receiving unit, the drive device driving the push device;

wherein the drive device comprises:

a reciprocating rod having a roller pushing the sheet push plate at a top end thereof, the reciprocating rod being arranged so as to normally cross the sheet push plane of the sheet push plate;

a movable base supporting a rear end of the reciprocating rod and moving in a direction normal to the sheet push plane of the sheet push plate;

a plurality of guide shafts slidably connected to the movable base and arranged parallel with the reciprocating rod;

a ball screw arranged parallel with the guide shafts and connected to the movable base so as to have a screw connection therebetween;

a first bevel gear fixed coaxially with the ball screw; and

a motor having a second bevel gear fixed on a rotational shaft thereof, the second bevel gear meshing with the first bevel gear.

10. The sheet handling apparatus according to claim 2, wherein the sheet receiving unit with the parallel crank mechanism is constructed so as to be able to separate from the drive device.

11. A sheet handling apparatus including:

a main unit;

a sheet validating device for determining whether a sheet received from outside is valid or not, the sheet validating device being provided in the main unit;

a sheet receiving unit which is detachable from the main unit;

a sheet feed device having a feed path to the sheet receiving unit and a plurality of roller pairs arranged at both sides of the feed path, the sheet feed device feeding the sheet which is determined as valid by the sheet validating device to the sheet receiving unit through the roller pairs;

a sheet support plate slidably arranged in the sheet receiving unit, the sheet support plate having a sheet support plane; and

a sheet push plate arranged so as to face to the sheet support plane of the sheet support plate, the sheet push plate moving the sheet fed to the sheet receiving unit through the roller pairs in the sheet feed device, toward the sheet support plane while pushing the sheet;

wherein when a rear end of the sheet fed to the sheet receiving unit is held by a roller pair positioned in a final stage among the roller pairs, the sheet push plate draws and separates the rear end of the sheet from the roller pair in the final stage and pushes the sheet to the sheet support plane of the sheet support plate.

12. The sheet handling apparatus according to claim 11, further comprising:

a push device constructed from a parallel crank mechanism connected to the sheet push plate, the parallel crank mechanism rotating the sheet push plate downward while retaining a parallel relation between a sheet push plane of the sheet push plate and the sheet support plane of the sheet support plate.

13. The sheer handling apparatus according to claim 12, wherein the parallel crank mechanism comprises:

a first link with a first end which is rotatably connected to a first rotational center positioned at an upper part of the sheet push plate;

a second link with a first end which is rotatably connected to a second rotational center positioned at a lower part of the sheet push plate;

a first shaft which is connected to a third rotational center positioned at a second end opposite to the first end in the first link, the second end being rotatable around the first shaft; and

a second shaft which is connected to a fourth rotational center positioned at a second end opposite to the first end in the second link, the second end being rotatable around the second shaft;

whereby the parallel crank mechanism constructs a quadric chain mechanism.

14. The sheet handling apparatus according to claim 13, wherein a first distance between the first rotational center and the second rotational center equals to a second distance between the third rotational center and the fourth rotational center,

wherein a third distance between the first rotational center and the third rotational center equals to a fourth distance between the second rotational center and the fourth rotational center, and

wherein a fixed link connecting the third rotational center and the fourth rotational center is arranged substantially parallel with a movement direction of the sheet fed out from the sheet feed device.